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RANGE MANAGEMENT NOTES

REGION 3

NOTE NO. 2 January 21, 1974 FILE: REA HANDBOOK
(FS) CHAPTER 30

RANGE SUITABILITY GUIDELINES

Introduction

Range suitability guidelines are designed to assist the range technician in determining whether or not a given area of range is suitable for grazing. Basic to this determination is premise that range should not be grazed if the use will accelerate soil erosion. The assistance of a Soil Scientist is recommended whenever suitability determinations are being made.

In order to properly evaluate suitability, the range examiner must be a critical observer of what is taking place in the plant-soil environment. Occurrences such as sheet erosion, soil creep, pedestaling, soil deposition, and terracing must be detected and evaluated. The distinction of whether or not observed indicators of instability are current or whether they are the result of past abuse, now alleviated, must be made. If it is determined that accelerated soil movement is occurring under present use, a change in management is necessary.

Several approaches to suitability classification are provided, and the merits of each are discussed. The range technician should apply the most appropriate method(s), depending on the availability of soils information, for the particular situation. Regardless of the method used, the expertise of a Soil Scientist should be incorporated into the application of the method, preferably in a coordinated approach with the range technician. As with all mechanical methods of evaluating biological phenomena, the results should be critically evaluated from the common sense standpoint.

EROSION HAZARD METHOD

A. General Description.

Primary elements of the erosion hazard method are soil type, slope, and percent of effective ground cover present. Once the normal geologic rate of soil loss is determined for the specific soil, any slope-cover relationship that has an on-site soil loss in excess of

this amount is undergoing accelerated erosion and should not continue to be grazed in the present manner. The details concerning computation of on-site soil loss are covered in R-3 Soil Note No. 13. A conversational computer program called EROSON is operational whereby soil loss tables for a particular soil may be computed via terminal link.

B. Application.

This method is best used to determine the upper extent of range suitability on slopes exceeding 20 percent. It becomes less and less applicable as a suitability determinant when slopes approach 0 percent slope. This method can be used as an indicator of the amount of soil loss occurring on depleted, gentle terrain rather than as a guide to range suitability on inherently productive sites.

C. Procedure.

1. On-site soil loss tables must be prepared for the soils in question. These tables can be prepared by a Soil Scientist via Forest terminal or by request to the Watershed Division of the Regional Office on those allotments covered by a soil survey. Soil Scientists can also work up effective tables, following a general reconnaisance of the allotment with the range technician on allotments lacking a soil survey.

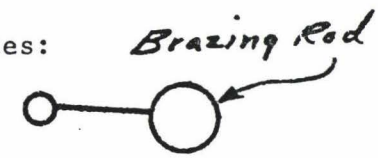
2. Once soil loss tables have been prepared for the allotment to be analyzed, the range technician, preferably with the Soil Scientist, establishes the percent of ground cover that each particular soil can support under either relic or properly managed conditions. The rate of erosion occurring at this particular slope-cover relationship is considered as normal geologic erosion. Slope-cover relationships producing a higher soil loss rate than geologic erosion are undergoing accelerated erosion.

D. Technique.

1. Locate sampling transects on the gentler one-third of the soil type to sampled on a relic or well managed site. Obtain a representative sample of effective ground cover present on the site within a particular soil and slope.

2. It is suggested that a 0.96 square foot loop be used as a sampling device. Estimate and record the percentage of non-rock surface in increments of one-tenth of the loop. In

Note: A coverage estimate guide improves estimates:
1% loop = 4.15" in circumference.
5% loop = 9.42" in circumference.



addition, estimate the percentage of non-rock surface covered with effective ground cover in increments of one-tenth of the loop. A minimum of 10 samples should be taken at each transect. Total each of the values recorded for non-rock and ground cover. Divide the non-rock total into the ground cover total to obtain the percentage of effective ground cover present on the transect.

$$\% \text{ Fffective Ground Cover} = \frac{\text{Vegetation + Litter}}{\text{Vegetation + Litter + Bare Soil}}$$

Effective Ground Cover = The basal area of perennial vegetation, taken at ground level, plus litter of sufficient depth and mass to minimize the impact of sustained rain drops. Include as effective vegetation the crown perimeter of shrubs and half-shrubs which is in contact with the surface of the ground.

Rock = All stones larger than 2mm (0.1") diameter.

3. Circle the erosion rate occurring at the intersection of the applicable percent slope and percent effective ground cover axis in the table (see Exhibits). This is considered to be the normal geologic erosion rate for the particular soil.

4. Draw a line to the right of the circled erosion rate, separating erosion rates in the table which are either greater than or less than the normal geologic rate. Those slope-cover relationships resulting in an erosion rate greater than the circled rate are undergoing accelerated erosion.

5. Once the normal geologic erosion rate line has been drawn on the table, the range technician can proceed with suitability type mapping on the particular soil. Samples should be taken as needed to verify ocular estimates of effective ground cover, and slope estimates verified with a clinometer or abney. Percent slope, ground cover (vegetation + litter) and rock should be recorded on aerial photos and on the REA map for areas determined to be unsuitable for grazing under present management.

E. Interpretation.

1. The rate of actual on-site soil loss is compared to the normal geologic rate. If accelerated erosion is taking place (as verified by actual observations), the site should not be grazed in its current condition under the present grazing system.

2. Soils which are inherently unstable and cannot be expected to produce sufficient cover to become stable in the presence of an attainable grazing system are to be typed as "range which should be closed to grazing."

3. Soils which are inherently productive and can be expected to produce sufficient cover to become stable should be typed as suitable range-problem area. No grazing capacity is given to these soils until such time as the necessary amount of cover is restored, either naturally or through artificial revegetation.

F. Observations.

1. The presence of erosion pavement tends to indicate a higher degree of suitability for grazing than is the case on moderate to steep slopes. Check for soil creep on such soils and if actively present, the site is unstable.

2. On undeveloped soils, such as granitics and cinders, consider soil creep as an indicator of unstability.

3. In general, soils with an on-site soil loss in excess of 0.10" per year should not be grazed in their present condition.

4. On some soils, the grazing history is such that a relic or properly managed site cannot be found to serve as a basis for determining the normal geologic rate. In these instances, estimate the effective ground percentage that the soil is capable of supporting and determine the normal geologic erosion rate using the estimate.

5. In general, slopes of 60 percent or greater are inaccessible to livestock and should be classified as nonrange. Inaccessibility on a given slope is largely influenced by the height, density and arrangement of woody vegetation and the amount and size of surface rock present. Observations of the degree of actual livestock use and the ability to cover it on horseback are good indicators of its accessibility.

6. Actual comparisons between similar sites illustrating differences in ground cover and stability as a result of past management are the finest kind of supporting data. Such comparisons provide "real world" information.

7. As stated in the REA Handbook, several studies have shown that 60 to 70 percent total ground cover (vegetation, litter, and rock) is necessary to protect mountain ranges from high intensity thunderstorms. The actual amount of total ground cover is easily determined with the 0.96 square foot loop.

AVAILABLE SOIL MOISTURE METHOD

A. General Description.

The amount of moisture which may be taken up from a soil by plants has long been used as an indicator of suitability of land for dry land farming. This factor is a function of soil texture and soil depth and is greatest for clays, sandy clay loams, and silt loams. The total amount of available soil moisture in a particular soil can be determined by soil scientists and is reported under the Watershed Management Interpretation section of soil surveys.

B. Application.

This method is best used to identify those soils which, when grazed, do not have the capability to support and sustain sufficient ground cover for their own protection. In general, soils which are unable to supply two inches or more of available soil moisture in the upper 24 inches of soil mantel, or to the depth of a restrictive layer if shallower, are not suitable for grazing.

C. Procedure.

Compute total available soil moisture to a depth of 24 inches, or to a restrictive layer if shallower, for soils on the allotment. Refer to soil surveys for basic information; if unavailable, Soil Scientists can provide sufficient information from a reconnaisance of the allotment. Consider soils with less than two inches of available moisture as unsuitable for grazing if this classification is supported by other factors such as pounds of forage production per acre, percentage of effective ground cover, slope, and the amount of soil loss actually occurring.

D. Observations.

1. This method is valuable when used in conjunction with other observations and methods to determine range suitability.

2. The presence of coarse rock cover influences this method in that rock cover increases the amount of the precipitation

received by the soil surface in proportion to the amount of rock. Stoney soils with available soil moisture levels of 1.0 to 2.0 inches may actually be quite productive due to this concentration of moisture, provided showers are received fairly regularly to maintain available soil moisture storage.

RULE OF THUMB METHOD

A. General Description.

The general rule of thumb, Section 33.22--2 of the REA Handbook, states that range which cannot be ridden or walked across without soil slipping or moving downhill should be typed as "should be closed to grazing." This rule of thumb has proven to be quite compatible with the Erosion Hazard Method.

B. Application.

This method is best used as the range technician inspects or analyzes an allotment. It is best suited for use on steeper slopes.

C. Procedure.

The range technician should ride or walk across the area in question, contouring the slope. If significant soil movement occurs, the area should not be grazed in its present condition.

D. Observations.

1. The amount of soil moisture present has an effect on soil movement. The best interpretations are made when the upper six inches of the soil is no more than moderately damp and is not frozen.

2. This method applies to undeveloped granitic and cinder soils as well as to developed soils.

SUMMARY

The three methods of determining range suitability suggested in this paper should be included in the range technician's bag of tools. Each has particular strong and weak points. Used together, along with actual observations and common sense, they are a valuable asset in conducting quality range inventories and achieving proper range management.

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ENTER SOIL NAME
?GRAHAM-HOUSE MOUNTAIN          UNITS  509  &  510
ENTER SURFACE ROCK COVER
?10
ENTER BASIC EROSION RATE.-AS-    .42
?.65
ENTER ERODIBILITY AS 1=HIGH, 2=MODERATE, 3=LOW
?2
ENTER 2 YR -30 MIN PRECIP.-AS- .75
?.7
ENTER NUMBER OF SLOPE CALCULATIONS
?11
ENTER THE SLOPE PERCENTAGES.-AS-  10,20, 30  ETC
?5, 10, 15,20,25,30,35,40,45,50,60
ENTER NO. COVER DENSITIES(MAX. NO. 7)
?7
ENTER PERCENT GROUND COVER DENSITIES
?10,20,25,30,40,50,60
ENTER PCT. GOOD COVER CLASS FOR EACH DENSITY ABOVE
AS 0-44=1, 45-74=2, 75-100=3.  EX.= ?1  ?1  ?1  ?2  ETC.
?2
?2
?2
?2
?2
?2
?2
?2
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TABLE..INCHES OF SOIL EROSION WITH DIFFERING SLOPES
AND VEGETATIVE COVERS.

SOIL- GRAHAM-HOUSE MOUNTAIN UNITS 509 & 510
SURFACE ROCK COVER- 10% 2YR-30 MIN. PPT.-0.70 INCHES
BASIC EROSION RATE- 0.65 IN./YR.
ERODIBILITY- MOD.

SLOPE %	MAXIMUM POTENTIAL EROSION	VEGETATIVE COVER DENSITY(%) 10	20	25	30	40	50	60
						Stable		
5	0.082	0.050	0.029	0.023	0.017	0.010	0.006	0.004
10	0.190	0.115	0.068	0.052	0.040	0.024	0.014	0.008
15	0.295	0.179	0.106	0.081	0.063	0.037	0.022	0.013
20	0.396	0.240	0.142	0.109	0.084	0.050	0.029	0.017
25	0.492	0.299	0.177	0.136	0.104	0.062	0.036	0.022
30	0.583	0.354	0.209	0.161	0.124	0.073	0.043	0.026
35	0.669	0.406	0.240	0.185	0.142	0.084	0.050	0.029
40	0.750	0.455	0.269	0.207	0.159	0.094	0.056	0.033
45	0.825	0.501	0.296	0.228	0.175	0.104	0.061	0.036
50	0.895	0.544	0.321	0.247	0.190	0.112	0.066	0.039
60	1.021	0.620	0.366	0.282	0.217	0.128	0.076	0.045
		Unstable						
VEG.COEFF.-		0.607	0.359	0.276	0.212	0.125	0.074	0.044

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ENTER SOIL NAME
?STAGECOACH    UNITS  60,61,&64
ENTER SURFACE ROCK COVER
?20
ENTER BASIC EROSION RATE.-AS-  .42
?.41
ENTER  ERODIBILITY AS 1=HIGH, 2=MODERATE, 3=LOW
?2
ENTER 2 YR -30 MIN PRECIP.-AS-  .75
?.7
ENTER NUMBER OF SLOPE CALCULATIONS
?8
ENTER THE SLOPE PERCENTAGES.-AS-  10,20,30  ETC
?5,10,15,20,25,30,35,40
ENTER NO. COVER DENSITIES(MAX. NO. 7)
?7
ENTER PERCENT GROUND COVER DENSITIES
?10,20,25,30,35,40,50
ENTER PCT. GOOD COVER CLASS FOR EACH DENSITY ABOVE
AS 0-44=1, 45-74=2, 75-100=3.  EX.= ?1 ?1 ?1 ?2  ETC.
?1
?1
?1
?1
?1
?1
?1
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TABLE..INCHES OF SOIL EROSION WITH DIFFERING SLOPES
AND VEGETATIVE COVERS.

SOIL- STAGECOACH UNITS 60,61,&64
SURFACE ROCK COVER- 20% 2YR-30 MIN. PPT.-0.70 INCHES
BASIC EROSION RATE- 0.41 IN./YR.
ERODIBILITY- MOD.

SLOPE %	MAXIMUM POTENTIAL EROSION	VEGETATIVE COVER DENSITY(?) 10	20	25	30	35	40	50
					Stable			
5	0.052	0.034	0.022	0.018	0.014	0.012	0.009	0.006
10	0.120	0.079	0.051	0.041	0.033	0.027	0.022	0.014
15	0.186	0.123	0.080	0.064	0.052	0.042	0.033	0.022
20	0.250	0.165	0.107	0.086	0.069	0.056	0.045	0.029
25	0.310	0.206	0.133	0.107	0.086	0.069	0.056	0.036
30	0.368	0.244	0.158	0.127	0.102	0.082	0.066	0.043
35	0.422	0.280	0.181	0.146	0.117	0.094	0.076	0.049
40	0.473	0.313	0.203	0.163	0.131	0.106	0.085	0.055
		Unstable						
VEG.COEFF.-		0.662	0.429	0.345	0.278	0.224	0.180	0.177

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